AL.2.2004-349

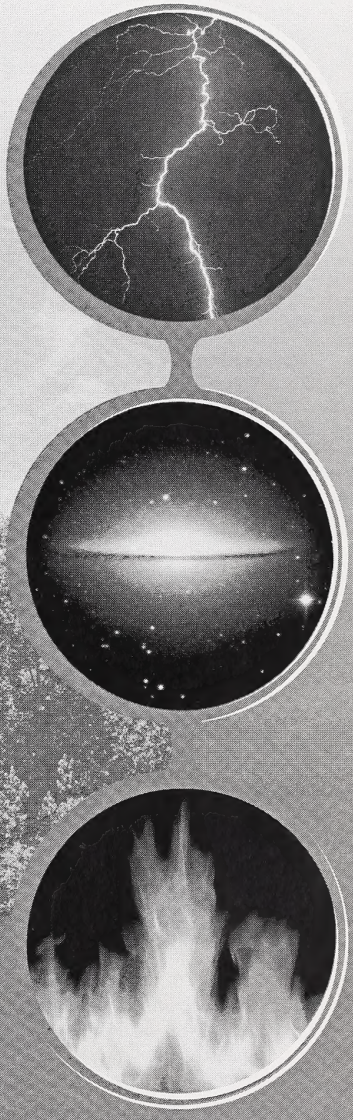
University of Alberta Library
0 1620 3682054 4

SCIENCE 9

Module 5

Space Exploration

Home Instructor's Guide and Assignment Booklet 5A



Learning Technologies Branch

Alberta LEARNING

Science 9
Module 5: Space Exploration
Home Instructor's Guide and Assignment Booklet 5A
Learning Technologies Branch
ISBN 0-7741-2599-3

Cover Art: middle right: Corbis
remainder: PhotoDisc Collection/Getty Images

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Copyright © 2004, Alberta Learning. This resource is owned by the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 10155 – 102 Street, Edmonton, Alberta, Canada T5J 4L5. All rights reserved.

No part of this courseware may be reproduced in any form, including photocopying (unless otherwise indicated), without the written permission of Alberta Learning. This courseware was developed by or for Alberta Learning. Third-party content has been identified by a © symbol and/or a credit to the source. Every effort has been made to acknowledge the original source and to comply with Canadian copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so corrective action can be taken.

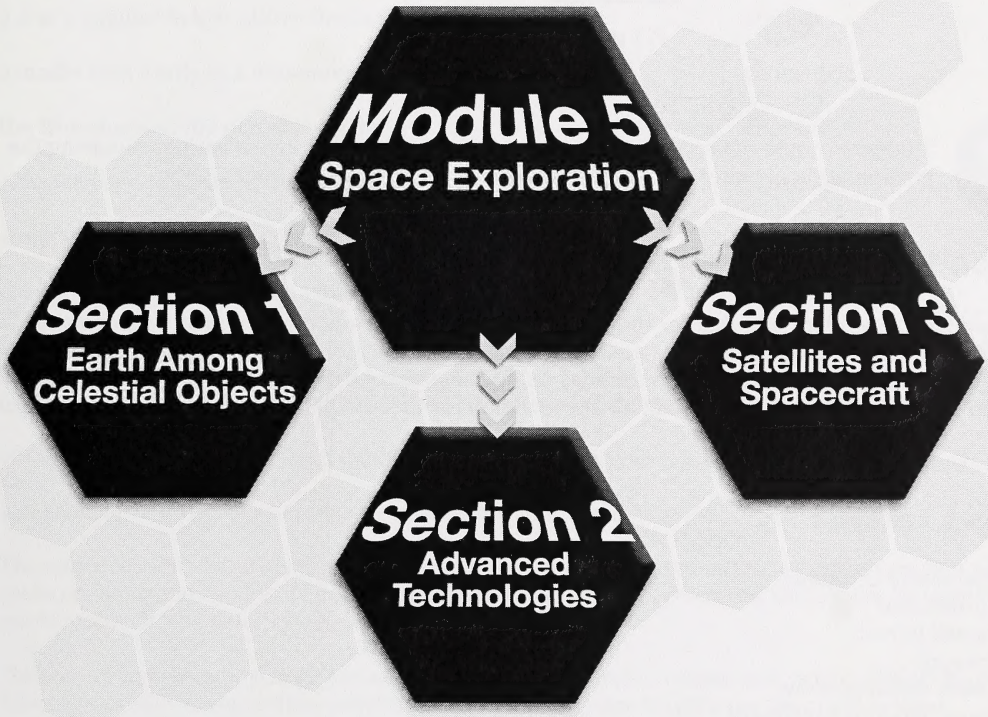
THIS COURSEWARE IS NOT SUBJECT TO THE TERMS OF A LICENCE FROM A COLLECTIVE OR LICENSING BODY.

UNIVERSITY LIBRARY

Module 5: Space Exploration

The major emphasis of this module is Science and Technology.

In this module the student will study not only space but also how it is explored with modern technologies. The student will see how science and technology interact in this exploration. Technologies for space exploration contribute to the understanding of the solar system and the universe beyond. As a further benefit, these technologies also serve practical purposes on Earth.



Assessment

The student's successful completion of all assignments in the Assignment Booklets will depend on practice obtained while doing the various activities and readings. Choices of activities have been provided so that students have some control over their own learning.

The following distribution of marks is suggested in determining the student's grade for this module.

Assignment Booklet 5A	
Section 1 Assignment	46 marks
Section 2 Assignment	41 marks
Assignment Booklet 5B	
Section 3 Assignment	33 marks
Final Module Assignment	52 marks
TOTAL	172 marks

Students should have safety goggles and latex gloves for all investigations involving the manipulation of materials. Have students pay attention to all safety icons.

Section 1: Earth Among Celestial Objects

In this section the student investigates the development of optical and measurement technologies. These technologies led to better observations and interpretations of the number, position, and motion of bodies near Earth. The student sees how these findings led to the present-day model of the solar system. The evolution of this model gave the student an appreciation for the role of technologies in advancing science.

The following materials will be needed to complete this section.

Section 1: Lesson 1

- a geometry compass
- a protractor
- a small mirror
- scissors
- a wide drinking straw
- heavy paper or cardboard
- two round-headed paper fasteners
- tape
- a paper clip

Section 1: Lesson 2

- string
- paper
- pins
- cardboard
- a variety of round objects that can act as scale models for planets (depends on student's model)
- a tape measure or a ruler (depends on the scale chosen by student)

Section 1: Lesson 3

No extra materials are needed for this lesson.

Suggested Answers

Section 1: Lesson 3

Textbook questions 1 to 3 and question 7 from "Wrap-up: Topics 1 and 2," page 375:

1. The descriptions in column *A* line up with the terms in column *B*.

A	B
a star's angular height above the horizon	altitude
a model with Earth as a non-moving frame of reference	geocentric
the true shape of the planets' orbits	elliptical
a device used to measure the altitude of an object	astrolabe
a model with the Sun as a non-moving frame of reference	heliocentric
used to measure an object's azimuth	compass
angles used to specify the co-ordinates of celestial bodies	altitude-azimuth co-ordinates
a set of axes used to describe the positions or motions of things	frame of reference
a telescope with a lens for the objective	refracting

2. In a geocentric frame of reference a building does not seem to move.

3. The space station would serve as the frame of reference for activities and observations that take place on, in, and around it. The Earth could act as the frame of reference that places or locates the space station in the solar system and the universe.

7. Ptolemy added the epicycle to Aristotle's model to explain the variation in brightness of the planets. They dim as they move farther away from Earth and become brighter as they come closer.

Section 2: Advanced Technologies

In this section the student will explore advanced technologies that have been developed to receive and process data about the universe. The student will investigate the use of spectroscopes and computer-controlled optical and radio telescopes. The student will also study the kind of inferences scientists make from the data collected with these modern tools.

The following materials will be needed to complete this section.

Section 2: Lesson 1

- a spectroscope
- coloured pens or pencils

Section 2: Lesson 2

- a protractor
- a ruler
- measuring tape
- cardboard

Section 2: Lesson 3

- an AM/FM radio
- wool
- plastic

Section 2: Lesson 4

No extra materials are needed for this lesson.

Suggested Answers

Section 2: Lesson 4

Textbook questions 1, 3, and 4 from "Wrap-up: Topics 3 to 5," page 398:

1. The descriptions in column *A* line up with the terms in column *B*.

A	B
a series of closely spaced lines that splits light into a spectrum	diffraction grating
all the various kinds of radiant energy	electromagnetic radiation
telescope technology that removes the effects of the atmosphere	adaptive optics
when images from two radio telescopes are combined using a computer	interferometry
using radio waves to learn about the stars	radio astronomy
the distance that light travels in one year	light-year
one method to measure the distance to the stars	triangulation
helps to measure the speed and direction of stars	Doppler effect
the scientific study of spectra	spectroscopy

3. An emission spectrum is produced when a gas at low pressure is heated and the resulting light is passed through a diffraction grating or a prism.

   An absorption spectrum is produced when light from a source with a continuous spectrum is passed through a cooler gas, then through a diffraction grating or a prism. The cooler gas absorbs some of the light from the continuous spectrum.

4. Spectral lines of the star's spectrum would be shifted toward the blue end. In other words, there would be a blue-shift in its light.

Digitized by the Internet Archive
in 2016 with funding from
University of Alberta Libraries

https://archive.org/details/science905albe_0

ASSIGNMENT BOOKLET 5A

Science 9
Module 5: Section 1 Assignment and Section 2 Assignment

Home Instructor's and Student's Comments:

STUDENT FILE NUMBER
(if label is missing or incorrect)

_____

Date Submitted:

_____

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Teacher's Comments

_____
Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each Assignment Booklet as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

MAILING

1. Do **not** enclose letters with your Assignment Booklets. **Send all letters in a separate envelope.**

2. Put your Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach **sufficient postage** and seal the envelope.

FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

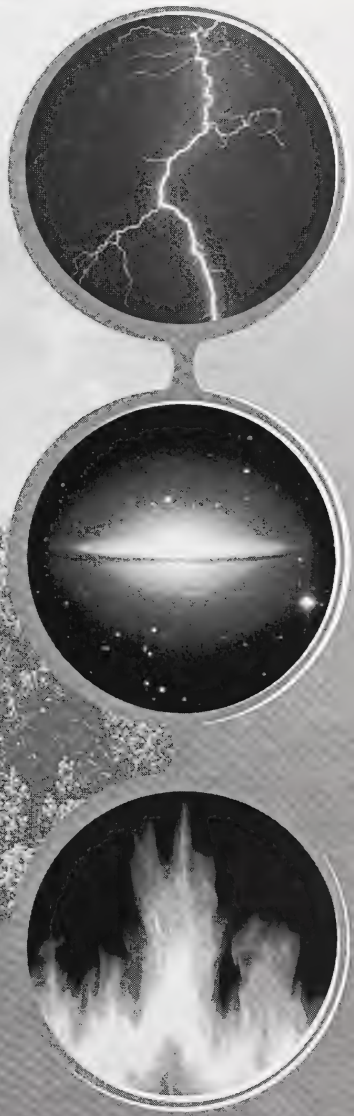
It may be possible to e-mail your completed Assignment Booklet to the school with which you are registered. Contact your teacher for the appropriate e-mail address.

SCIENCE 9

Module 5

Space Exploration

Assignment Booklet 5A



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 1 Assignment	46	
Section 2 Assignment	41	
	87	

Teacher's Comments

Science 9
Module 5: Space Exploration
Assignment Booklet 5A
Section 1 Assignment and Section 2 Assignment
Learning Technologies Branch

Cover Art: middle right: Corbis
remainder: PhotoDisc Collection/Getty Images

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Learning, **http://www.learning.gov.ab.ca**
- Learning Technologies Branch, **http://www.learning.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Copyright © 2004, Alberta Learning. This resource is owned by the Crown in Right of Alberta, as represented by the Minister of Learning, Alberta Learning, 10155 – 102 Street, Edmonton, Alberta, Canada T5J 4L5. All rights reserved.

This courseware was developed by or for Alberta Learning. Third-party content has been identified by a © symbol and/or a credit to the source and must be used as is. This courseware may be reproduced in any form, including photocopying, without the written permission of Alberta Learning. Changes can be made only to content owned by Alberta Learning. For more detailed information, refer to the Terms of Use Agreement. Every effort has been made to acknowledge the original source and to comply with Canadian copyright law. If cases are identified where this effort has been unsuccessful, please notify Alberta Learning so corrective action can be taken.

THIS COURSEWARE IS NOT SUBJECT TO THE TERMS OF A LICENCE FROM A COLLECTIVE OR LICENSING BODY.

ASSIGNMENT BOOKLET 5A
SCIENCE 9: MODULE 5
SECTION 1 ASSIGNMENT AND SECTION 2 ASSIGNMENT

Your mark for this module will be determined by how well you do your assignments.

This Assignment Booklet is worth 87 marks out of the total 172 marks for the assignments in Module 5. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

Section 1 Assignment: Earth Among Celestial Objects

(46)

Read all parts of your assignment carefully and record your answers in the appropriate places.

(1) **1.** Circle the letter of the correct response.

The legend of Malina and Anningan was used as a traditional explanation for the motion of the Sun and Moon in the sky. Which of the following people used this legend?

A. Inuit
B. Iroquois
C. Mohawk
D. Vikings

2. Stretching your arm out and facing in the direction of your arm, you point out an airplane in the sky. Pointing out its location is like using the device you constructed for "Investigation 5A: Where in the Sky?" on pages 360 to 362 of the textbook.

(1) **a.** The height of your arm corresponds to which co-ordinate?

_____

(1) **b.** The direction to which you face corresponds to which co-ordinate?

_____

_____

_____

3. Refer to "Part 2: Measure the Sun's Co-ordinates" from "Investigation 5A" on page 362 of the textbook.

(2) **a.** How would the Sun's altitude and the azimuth scale vary between summer and winter?

(1) **b.** Suppose you compared the Sun's path for the same day in Alberta and in Mexico. What differences would you observe?

(2) **4.** Refer to the diagram on page 365 of the textbook. Provide the Moon's co-ordinates.

The azimuth is _____. The altitude is _____.

5. A bus zooms past you on the right as you stand by the roadside. You see one seated passenger. A second passenger is quickly walking toward the back of the bus.

(3) **a.** What motions do the bus and each of the passengers have relative to you?

(1) **b.** What motion does the walking passenger have relative to the bus?

(2) **c.** The bus represents all of the stars moving through the night sky, and the walking passenger represents a planet. Compare the apparent motion of the planet to the rest of the stars.

(2) **d.** In which frame of reference is it easier to measure the precise movement of the seated and walking bus passengers? Why?

_____

_____

(2) **e.** Is it easier to measure the apparent motion of a planet in relation to Earth or to the stars? Why?

_____

_____

_____

(8) **6.** Match the people or items on the right with their related descriptions on the left. Fill in the blanks to the left of the descriptions.

_____ **a.**	technology developed to mark Moon and Sun movements	A. Ptolemy
_____ **b.**	developed heliocentric model of the universe	B. ancient Babylonians and Hindus
_____ **c.**	epicycles an attempt to explain retrograde motion	C. ancient Egyptians
_____ **d.**	Ra carried Sun across sky in his boat	D. Snohomish
_____ **e.**	invented astrolabe	E. Stonehenge
_____ **f.**	knew stars formed unchanging patterns in sky	F. ancient Greeks
_____ **g.**	three hunters chasing four elk became Big Dipper	G. ancient Romans
_____ **h.**	planet Jupiter was king of the gods	H. Nicholas Copernicus

Return to page 19 of the Student Module Booklet and continue with Lesson 2.

5

7. Refer to page 373 in your textbook. Read "Did You Know?" that features a photo of a solar eclipse. Use a labelled diagram to explain why the ratio of the distances and the ratio of the diameters are the same.

Hint: Think of an observer at the tip of a triangle.

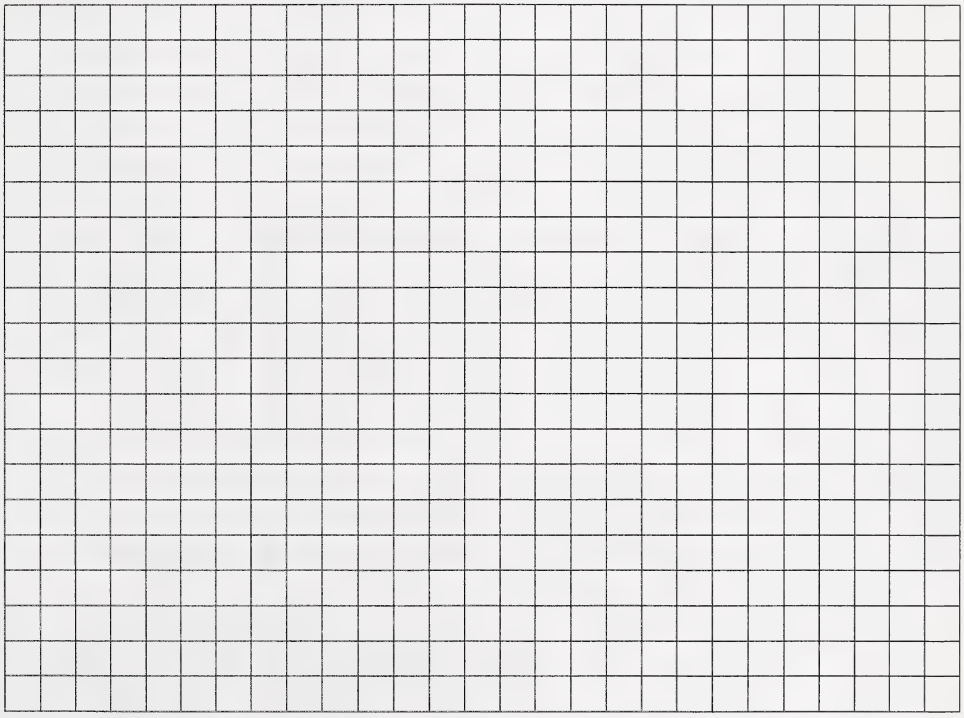
8. The following data was collected over one year at latitude 42° N on the 21st of each month.

Observing the Sun's Noon Altitude												
Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Sun's maximum altitude (°)	28	37	48	60	68	71	68	60	49	37	28	25

(12)

a. Using the given data, plot a line graph. Place "Maximum Altitude (°)" on the vertical axis and "Date" on the horizontal axis. Draw a smooth curve through the data points of the graph.

Be sure to follow the graphing standards noted in "Skill Focus 10: Organizing and Communicating Scientific Results" on pages 473 to 478 of the textbook.



(1) **b.** At what time of the year is the Sun's noon altitude at a maximum?

_____

(1) **c.** At what time of the year is the Sun's noon altitude at a minimum?

_____

(1) **d.** Use your graph to estimate the Sun's maximum altitude on August 5th.

_____

Return to page 25 of the Student Module Booklet and continue with Section 2.

41

Section 2 Assignment: Advanced Technologies

Read all parts of your assignment carefully and record your answers in the appropriate places.

3

1. Fraunhofer discovered that the Sun's spectrum and the spectrum of moonlight are identical. Give two reasons to explain why these spectrums are identical.

_____

_____

_____

_____

2

2. Refer to the diagrams on page 384 of the textbook.

a. The two diagrams on the lower left part of the page are models of wavelengths of red and blue light. Which one of these diagrams represents red light? Explain.

_____

_____

9

b. Refer to the spectral diagrams on the right side of page 384. Provide the composition of stars A, B, and C. Indicate whether each spectrum is red-shifted or blue-shifted. Also, state if each star is moving away from or toward Earth.

	Composition	Type of Shift	Motion Relative to Earth
Star A			
Star B			
Star C			

1

c. What instrument must be used to study the spectrums of celestial bodies?

_____

(10)

3. Use the following list of terms to answer the question.

away	longer
blue-shifted	Lorentz-FitzGerald effect
colour	pitch
decreases	red-shifted
direction	shortened
Doppler effect	shorter
increases	speed
lengthened	toward

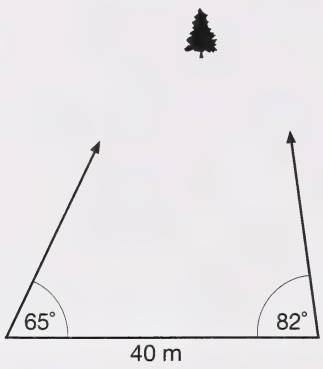
Fill in the blanks with the appropriate term from the list provided. Not all terms are to be used.

Electromagnetic waves are _____ as an object moves toward you. The faster the object moves toward you, the _____ the wavelength becomes. The distance between wave crests _____ as the object moves away from you. These changes in frequency, called the _____, allow you to sense the _____ and _____ of a moving vehicle without seeing it. Astronomers also use these electromagnetic wave changes. If the spectral lines move closer together, they are referred to as being _____. This indicates that the star is moving _____ Earth. Sound waves change _____, while light waves change _____.

Return to page 32 of the Student Module Booklet and continue with Lesson 2.

(7)

4. Use the following diagram to complete the question.



Using the following space, make a labelled scale diagram of your own to determine how far away the tree is. Show your calculations.

(3) **5.** List three reasons why larger telescopes allow astronomers to create a more accurate picture of the universe.

- _____
- _____
- _____

(2) **6.** The first commercial, broadcast TV signals were emitted in about 1950. Some of the signals travelled into space and travel at the speed of light. Indicate how far into space TV signals emitted in 1950 have now travelled.

Hint: You may express your answer in any reasonable unit that you find convenient. Pick a unit that is easiest for you to work with.

Return to page 36 of the Student Module Booklet and continue with Lesson 3.

(3) **7.** A star is located 543 000 AU from the Sun. How far away is it in light-years? Show all your work.

(1)

8. Circle the letter of the best response.

Which form of electromagnetic radiation best penetrates clouds and dust?

A. infrared light
B. radio waves
C. red light
D. blue light

Submit your completed Assignment Booklet 5A to your teacher for assessment.
Then return to page 40 of the Student Module Booklet and begin Section 3.

ASSIGNMENT BOOKLET DECLARATIONS

The school you are registered with may require you to submit this signed form with your Assignment Booklet.

The Student's Declaration is to be signed by the student. If the student is under 16, the Supervisor's Declaration may need to be signed by the supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results. Please contact your school and ask if this completed form is required.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

_____

_____

_____

_____

_____

_____

_____

_____

© 2004